Date: Wed, 29 Sep 93 04:30:23 PDT
From: Ham-Homebrew Mailing List and Newsgroup <ham-homebrew@ucsd.edu>
Errors-To: Ham-Homebrew-Errors@UCSD.Edu
Reply-To: Ham-Homebrew@UCSD.Edu
Precedence: Bulk
Subject: Ham-Homebrew Digest V93 #59
To: Ham-Homebrew

Ham-Homebrew Digest Wed, 29 Sep 93 Volume 93 : Issue 59

Today's Topics:

Send Replies or notes for publication to: <Ham-Homebrew@UCSD.Edu>
Send subscription requests to: <Ham-Homebrew-REQUEST@UCSD.Edu>
Problems you can't solve otherwise to brian@ucsd.edu.

Archives of past issues of the Ham-Homebrew Digest are available
(by FTP only) from UCSD.Edu in directory "mailarchives/ham-homebrew".

Date: 29 Sep 93 00:05:13 GMT
From: ogicse!hp-cv!sdd.hp.com!hpscit.sc.hp.com!rkarlqu@network.ucsd.edu
Subject: Anyone interested in discussing PLL synt
To: ham-homebrew@ucsd.edu

In article <28ag3e$h39@newscast.west.sun.com>,
Dana Myers <myers@cypress.West.Sun.COM> wrote:

>>How do you know they are simple synthesizers using a single mixerless loop
>>with a 5 kHz. reference frequency?
>
>I'm as capable as anyone else when it comes to reading to schematics. block
>diagrams, and service manuals. You are teasing, aren't you?

No offense intended. I just wanted to make sure you had actually done that
rather than guessing. Like I said, it was contrary to my experience; I
stand corrected.

>Yes, the (VHF) MCX100 easily passes all the tests you described. If you'd
>like, I'dbe happy to send a copy of the manual page which describes the
>synth design. It uses a single chip device driving a sample/hold phase comp.

The sampling phase detector allows them to get around the traditional problem
you have with reference frequency sidebands. Unfortunately, most ham designs
use digital phase detectors patterned after the 4044. BTW, the MC145159
synthesizer chip with sampling phase detector has a bug in it, so if you
use it, be aware of the bug. The Philips sampling synthesizer chips have
their own problems.

>The VCO is rather special, though. It is a hybrid microcircuit, uses a
>micro-stripline inductor, with PIN switches for range selection. The VCO
>is attached to the die-cast chassis and covered by a die-cast cover. The
>entire synth then is covered by a very snug shield, attached with a big screw.
>Mechanically very rigid. Radio is extremely rugged. Speaker is external,
>but I set the speaker on the radio without howling. Radio can be pounded on
>without detectable microphonics.
>
>Gawd, I love Motorola.

Yes, that is a valid approach (typical Motorola) to the problem. It just
doesn't lend itself to homebrew construction, unless you cheat and buy a
VCO from Motorola, which might not be a bad idea. The VCO's in cellular
phones are damn good too and only cost $20 (or less if you buy them surplus).

> * Dana H. Myers KK6JQ, DoD 466 | Views expressed here are
    *

Rick Karlquist N6RK
rkarlqu@scd.hp.com

Date: 28 Sep 1993 23:07:26 GMT
From: olivea!koriel!newscast.West.Sun.COM!sunspot!myers@uunet.uu.net
Subject: Anyone interested in discussing PLL synt
To: ham-homebrew@ucsd.edu

In article 48p@hpscit.sc.hp.com, rkarlqu@scd.hp.com (Richard Karlquist) writes:
>>Why does synthesizing at 146Mhz and then dividing produce a signal with poorer
>>characteristics than radios which directly synthesize at 146 Mhz?
>
>I didn't say it was poorer, only equally poor.

I rather suspected that :-). It probably would have been more illuminating
to say something like "the performance of an average amateur VHF PLL
synth is not nearly what it can be". :-)

>>I'm suggesting building a single loop 146Mhz synth with no prescaler,
>>using a 5KHz reference. The only trick is to divide the output down to
>>be compatible with the radio's multipliers.

[deleted]

>Whenever I have built loops like that, I had a lot of trouble with them.
>Try these tests: mount the speaker in the same chassis with the radio,
>including the VCO for the synthesizer. Now turn the speaker up nice and
>loud, so you can get good copy driving on the freeway with your windows
>open. You tend to get feedback from the speaker modulating the VCO.
>The radio typically will start howling. Another test: place the radio
>on top of an AC power supply. You tend to get a lot of 60 Hz. modulation
>from the power transformer leakage field modulating the core of the VCO coil.

Sounds like a Ramsey radio.... :-) Honestly, I used to use a Kenwood
TM-2550 that had real problems like this, too.

>>I've seen several VHF synthesizers operating at 146Mhz that have no detectable
>>microphonics, low phase noise and no problem with power supply sensitivity.
>
>How do you know they are simple synthesizers using a single mixerless loop
>with a 5 kHz. reference frequency?

I'm as capable as anyone else when it comes to reading to schematics. block
diagrams, and service manuals. You are teasing, aren't you?

>>For example, a Motorola MCX100 is quite good in all these respects.
>
>I am not familiar with that specific model, but the Motorola synthesizers
>I am familiar with are generally not single mixerless loops. Does the
>MCX100 pass the tests I mentioned above? Also, how low are the 5 kHz.
>sidebands? If it is as good as you say it is, then they probably have
>developed some really good VCO technology. But that won't help you with
>this architecture unless you use their hot shot VCO.

Yes, the (VHF) MCX100 easily passes all the tests you described. If you'd
like, I'dbe happy to send a copy of the manual page which describes the
synth design. It uses a single chip device driving a sample/hold phase comp.
It is programmed with a TTL PROM.

The VCO is rather special, though. It is a hybrid microcircuit, uses a
micro-stripline inductor, with PIN switches for range selection. The VCO
is attached to the die-cast chassis and covered by a die-cast cover. The
entire synth then is covered by a very snug shield, attached with a big screw.
Mechanically very rigid. Radio is extremely rugged. Speaker is external,
but I set the speaker on the radio without howling. Radio can be pounded on

without detectable microphonics.

Granted, most ham gear is not nearly this good, and you have very good points.

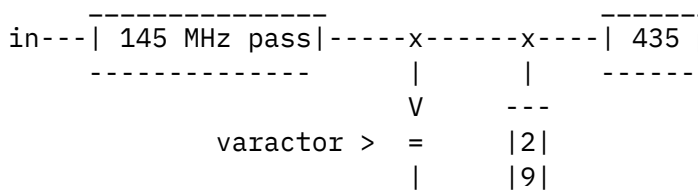
Gawd, I love Motorola.

---
 * Dana H. Myers KK6JQ, DoD 466 | Views expressed here are
    *
 * (310) 348-6043 | mine and do not necessarily   *
 * Dana.Myers@West.Sun.Com | reflect those of my employer
    *
 * This Extra supports the abolition of the 13 and 20 WPM tests *

Date: Tue, 28 Sep 1993 13:49:14 GMT
From: dog.ee.lbl.gov!agate!howland.reston.ans.net!gatech!kd4nc!ke4zv!
gary@network.ucsd.edu
Subject: HELP WANTED: Diode tripler for 145 to 435Mhz
To: ham-homebrew@ucsd.edu

In article <16C56E15E.DOUG@HDQCMS2H.UTSD.ATT.COM> DOUG@HDQCMS2H.UTSD.ATT.COM
(Douglas Quagliana) writes:
>I'm looking for a design or construction article on a diode tripler
>that will take a 145Mhz FM signal in and put out a 435Mhz FM signal.
>
>Does anyone have any pointers on how to do this ???? One source told me
>to see the book _FM_and_Repeaters_ 2nd edition. (1978) pp.49-50 but
>this is OUT OF PRINT!! Does anyone have a copy? I only need those pages.
>Please email me if you have this book.
>
>Other ideas/designs/plans are most welcome. I would like to start with
>my 145Mhz FM signal and end up with about 10 watts of 435Mhz FM, but
>I'm a bit unclear on how to make this happen (except that it has
>something to do with diode triplers.)

Ok, I'll take a stab at this. What you want is a *varactor* tripler.
This circuit has a 145 MHz tuned input, the varactor, an idler tank
tuned to 290 MHz, and an output circuit tuned to 435 MHz. It looks
something like this:



The idler tank improves efficiency by giving a 2nd harmonic signal
for the input to mix with.

Gary
--
Gary Coffman KE4ZV |"If 10% is good enough | gatech!wa4mei!ke4zv!gary
Destructive Testing Systems | for Jesus, it's good | uunet!rsiatl!ke4zv!gary
534 Shannon Way | enough for Uncle Sam."| emory!kd4nc!ke4zv!gary
Lawrenceville, GA 30244 | -Ray Stevens |

Date: 28 SEP 93 15:06:24 GMT
From: tribune.usask.ca!skyfox!koehler@decwrl.dec.com
Subject: Rick Campbell's R2/T2
To: ham-homebrew@ucsd.edu

Jim, VE5FP

Date: 28 Sep 1993 19:22:25 GMT
From: swrinde!elroy.jpl.nasa.gov!usc!howland.reston.ans.net!spool.mu.edu!olivea!
koriel!newscast.West.Sun.COM!sunspot!myers@network.ucsd.edu
Subject: TR-2600A: PLL performance analysis
To: ham-homebrew@ucsd.edu

For giggles, I decided to evaluate the PLL in my Kenwood TR-2600A HT.

I used the Kenwood TR-2600A service manual and Motorola MC14155 data
sheet to determine the various arcane numbers I use.

The low pass filter used is the damped RC filter presented as
filter "B" in the MC145155 data sheet. The response of this
filter is:

$$F(s) = (t2*s + 1)/(t1*s + 1)$$

$$t1 = (R1+R2)*C$$
$$t2 = R2*C$$

$C = 2.2uF$
$R1 = 10K$
$R2 = 470$

The phase detector gain (Kp) is equal to Vdd/4*Pi. The Service Manual shows
5.7V as the typical Vdd; hence Kp = 5.7/(4.0*Pi).

The VCO gain (Kv) is suggested by the tuning instructions on page 33 of
the Kenwood manual. This shows a minimum control voltage of 1.4V when
operating at 140.000Mhz and a maximum of 5.2V when operating at 149.995MHz.
This gives Kv = (2*Pi*9.995Mhz)/(5.2V-1.4V).

Since the reference frequency is 5KHz, N=f/5Khz. For a mid-band 146MHz transmit
frequency, N = 29200.

Using the Motorola supplied equations:

     wn = sqrt((Kv*Kp)/(N*C*(R1+R2))) or 105.57 rad/sec (16.8Hz).
     damping = 0.5*wn*(C*R2+N/(Kp*Kv)) or 0.260

The rather low damping factor suggests this PLL will be somewhat unstable
after a frequency change. Sure enough, when I push PTT, the HT starts
transmitting with a ker-chunking noise on the transmitted audio. Looking
at the audio on a receiver with a scope shows the ringing PLL characteristic.

I wonder why Kenwood underdamped the PLL so seriously. More damping would result
in slower response to frequency change, but the PLL takes so long to settle down
I'm not sure it is worth it. I can't help but wonder if the filter was changed
in production to reduce the amount of time it takes the radio to lock-up at
the expense of allowing a significant ringing each time PTT is pushed. This
ringing causes the radio to generate a "click" in a sharp receiver tuned to
an adjacent channel.

---

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    *

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Date: 28 Sep 1993 12:29:21 GMT
From: swrinde!elroy.jpl.nasa.gov!avdms8.msfc.nasa.gov!sauron!sims@network.ucsd.edu
Subject: TS-930S computer control hack?
To: ham-homebrew@ucsd.edu

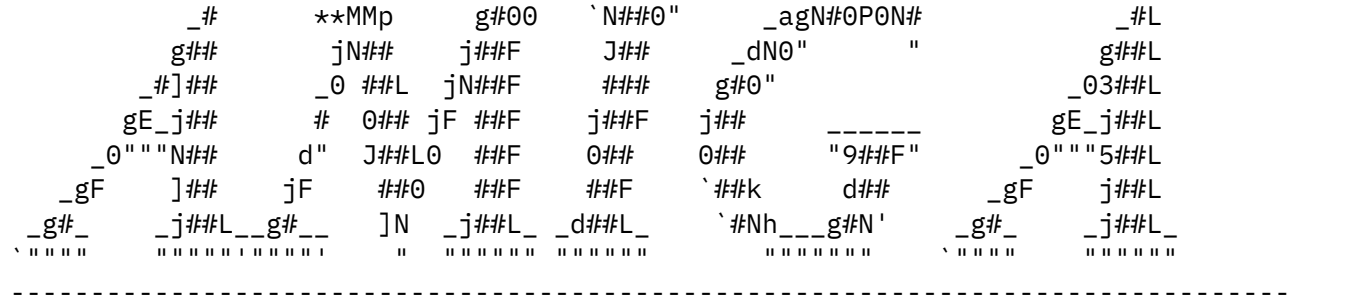
Well, the contest time is rolling around, and I was just wondering
if anyone out there knows of anyone who has designed and built
a hack for the kenwood ts-930s radio to allow computer interface?

Please e-mail direct.

Thanks,

Herb

W. Herb Sims sims@sauron.msfc.nasa.gov
KU0C sims@saruman.msfc.nasa.gov
MSFC/NASA/EB56 sims@avdms8.msfc.nasa.gov
Huntsville, AL 35812 PP-ASEL-IA



Date: 28 Sep 1993 15:55:33 GMT
From: dog.ee.lbl.gov!agate!spool.mu.edu!olivea!koriel!newscast.West.Sun.COM!
sunspot!myers@network.ucsd.edu
To: ham-homebrew@ucsd.edu

References <2489@indep1.UUCP>, <27smfj$q17@newscast.west.sun.com>,
<28215u$2c1@hpscit.sc.hp.com>COM
Subject : Re: Anyone interested in discussing PLL synt

In article <28215u$2c1@hpscit.sc.hp.com> rkarlqu@scd.hp.com (Richard Karlquist)
writes:
>>
>>A good way to avoid this and still realize your goal is to
>>build a 2m synthesizer. >Yup; run a VCO at the desired operating
>>frequency. Then, use a prescaler to >divide it by 12. This way,
>>using the Motorola MC145170, you can build a single
>>loop synthesizer which directly generates the
>i>required VHF signal using a 5KHz
>>reference and no heterodyne oscillators.
>>
>>The output of the divide-by-12 circuit would be
>>the VFO input. The radio, I assume,
>>would phase modulate this without any problem.
>>

>> * Dana H. Myers KK6JQ, DoD 466 | Views expressed here are
    *
>
>Well, this is certainly better than having an 833 Hz. reference frequency, but
>it will still give mediocre performance. Poor phase noise, poor microphonics,
>high power supply sensitivity. You really need to do the synthesis at a low
>frequency (around 10 MHz.) and then upconvert to VHF with a mixer using a
>crystal oscillator for an LO. Then divide by 12 or whatever.

Why does synthesizing at 146Mhz and then dividing produce a signal with poorer
characteristics than radios which directly synthesize at 146 Mhz?

I'm suggesting building a single loop 146Mhz synth with no prescaler,
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microphonics, low phase noise and no problem with power supply sensitivity.
For example, a Motorola MCX100 is quite good in all these respects.

What am I missing?

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From: olivea!spool.mu.edu!sdd.hp.com!hpscit.sc.hp.com!rkarlqu@decwrl.dec.com
To: ham-homebrew@ucsd.edu

References <27smfj$q17@newscast.west.sun.com>, <28215u$2c1@hpscit.sc.hp.com>,
<289mpl$buf@newscast.west.sun.com>
Subject : Re: Anyone interested in discussing PLL synt

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>

A simple single loop synthesizer that divides down from 146 MHz. to
5 kHz. will have a value of N of around 30,000 and a loop bandwidth
of 100 Hz. at best. The phase noise floor in the loop will typically
be only -30 to -60 dBc./Hz. due to the ridiculous value of N.
Whenever I have built loops like that, I had a lot of trouble with them.
Try these tests: mount the speaker in the same chassis with the radio,
including the VCO for the synthesizer. Now turn the speaker up nice and
loud, so you can get good copy driving on the freeway with your windows
open. You tend to get feedback from the speaker modulating the VCO.
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>--
> * Dana H. Myers KK6JQ, DoD 466 | Views expressed here are
    *

Rick Karlquist N6RK
rkarlqu@scd.hp.com

End of Ham-Homebrew Digest V93 #59
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